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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,754	10/18/2005	Makoto Iida	125664	5979

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OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER	
MALEKZADEH, SEYED MASOUD	
ART UNIT	PAPER NUMBER
1791	

MAIL DATE	DELIVERY MODE
11/07/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,754	IIDA, MAKOTO	
	Examiner	Art Unit	
	SEYED M. MALEKZADEH	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10,14,18,22,26 and 27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10,14,18,22,26 and 27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Claims 10, 14, 18, 22, 26-27 are pending.

Claims 1-9, 11-13, 15-17, 19-21, 23-25, and 28 are cancelled.

In view of the amendment, filed on 07/17/2008, **following rejections are withdrawn** from the previous office action, mailed on 04/17/2008, for the reason of record.

- Rejection of claims 11-13, 15-17, 19-21, and 23-25 under 35 U.S.C. 112, second paragraph
- Rejection of claims 11-13, 15-17, 19-21, and 23-25 under 35 U.S.C. 103(a) as being unpatentable over Iida et al (US 6,048,395) in view of Kitamura et al (US 2001/0001944)

In view of the amendment, filed on 07/17/2008, **following rejections are maintained** for the reason of records as given in the previous office action. The basis of theses rejections are the same as given in the previous office action, mailed on 04/17/2008.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Falster et al (US 2001/0025597)

Claim 26-27 is drawn to a product, which is obtained by the process and therefore will be treated as required via MPEP 2113 [R-1].

> "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." (MPEP 2113[R-1])

As to claims 26-27, Falster et al (US 2001/0025597) teach a silicon single crystal ingot grown in accordance with the Czochralski method, wherein single crystal has a diameter of 200mm. (See paragraph [0129]).

The prior art, thus, meets all the claim limitations, and therefore Falster et al ('597) anticipates claims 26-27.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 10, 14, 18, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iida et al (US 6,048,395) in view of Kitamura et al. (US 2001/0001944)

Iida et al ('395) teaches a method for producing a silicon single crystal by Czochralski method by immersing a seed crystal into a raw material melt and pulling the seed crystal from the melt (See lines 62-67, column 2; and lines 13-24, column 11). Prior art further teaches the pulling rate of a single crystal along the pulling direction of the single crystal represented by F (mm/min) and the average temperature gradient at a solid-liquid interface of the single crystal represented by G (°K/mm) wherein the average temperature gradient varies within a temperature range of the silicon melting point to 1400°C, and therefore, the single crystal is pulled with a temperature less than 1560°C (See lines 51-67, column 1 and lines 1-14, column 8; also lines 60-67, column 10) Iida et al ('395) also disclose a defect-free silicon single crystal can be obtained by controlling the value of F/G such that the value of F/G falls within a range of 0.119 - 0.121 ($mm^2/°C \bullet \min$) at the center of the crystal. (See abstract, lines 51-67, column 7, and lines 1-13, column 8)

As recited above, Iida et al ('395) clearly suggests the average temperature gradient along the pulling direction changes within a temperature

range of within silicon melting point (1414°C) to 1400°C and accordingly the temperature controls the value of F/G within a range of 0.119 - 0.121 ($mm^2/°C \bullet \min$) for obtaining a defect free silicon single crystal. By substituting a range of temperatures between 1400°C to 1414°C as a (T) in the equations $-0.000724 \times T + 1.31 (mm^2/°K \bullet \min)$ and $-0.000724 \times T + 1.38 (mm^2/°K \bullet \min)$, a value of between 0.119 and 0.121 ($mm^2/°C \bullet \min$) will be obtained. Therefore, the prior art teaches the single crystal is pulled with controlling the value of F/G as claimed in claims 11-13.

However, Iida et al ('395) is silent about determining a highest temperature (T_{max}) between the crucible and the raw material melt, as claimed in claim 1, and also, Iida et al ('395) fail to teach providing a heat insulating material between the crucible and a heater.

In the analogous art, Kitamura et al. (US 2001/0001944) teach a process for producing an oxide single crystal through rotation pulling by means of a double crucible consisting of an outer crucible, which has similar functionality as a heat insulating material, and a cylindrical inner crucible for intersecting the surface of a melt in the outer crucible and connecting the melt at the bottom of the melt, wherein the outer crucible is positioned between the inner crucible and the heater (4); further, the process comprises pulling a single crystal from the inner crucible (See abstract) which disclosed method has a similar process functionality with the Czochralski method (CZ method). (See paragraph [0025]) Furthermore, Kitamura et al. ('944) teach by employing a

double crucible structure, the change in the temperature of the melt in the inner crucible can be made small, whereby defects in the obtained single crystal will be decreased. (See paragraph [0041]) Therefore, prior art teaches the temperature of the raw material melt at an interface between the crucible inner wall and a raw material melt as (T_{max}) controls the temperature gradient (G) of the melt and the amounts of the defects in the single crystal.

Therefore, it would have been obvious for one of ordinary skill in the art at the time of applicant's invention to modify teachings of Iida et al ('395) by determining a highest temperature (T_{max}) between the crucible and the raw material melt and also providing a heat insulating material between the crucible and a heater in order to stably growing a high quality and longitudinal crystal by rotation pulling, as suggested by Kitamura et al. ('944)

New grounds of Rejection

Claim Rejections - 35 USC § 112, Second Paragraph

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10, 14, 18, 22, and 26-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites "the range of a value of V/G ($mm^2/°K \bullet \min$) is selected from a group consisting of from $-0.000724[mm^2/(°C \bullet K \bullet \min)] \times T_{\max}(°C) + 1.31(mm^2/K \bullet \min)$ to less than $-0.000724[mm^2/(°C \bullet K \bullet \min)] \times T_{\max}(°C) + 1.38(mm^2/K \bullet \min)$, $-0.000724[mm^2/(°C \bullet K \bullet \min)] \times T_{\max}(°C) + 1.38(mm^2/K \bullet \min)$ or more, and from $-0.000724[mm^2/(°C \bullet K \bullet \min)] \times T_{\max}(°C) + 1.31(mm^2/K \bullet \min)$ to $-0.000724[mm^2/(°C \bullet K \bullet \min)] \times T_{\max}(°C) + 1.35(mm^2/K \bullet \min)$" **(see lines 16-24, claim 10)** in which renders the claim indefinite because specifically the claim recites the V/G range value is within $-0.000724 \times T_{\max}(°C) + 1.31$ to $-0.000724 \times T_{\max}(°C) + 1.35$ while further the claim recites the V/G range value is $-0.000724 \times T_{\max}(°C) + 1.31$ to less than $-0.000724 \times T_{\max}(°C) + 1.38$ and $-0.000724 \times T_{\max}(°C) + 1.38$ or more in which both of these limitations are contradict to each other because it is not defined how a V/G range value which is claimed to be within $-0.000724 \times T_{\max}(°C) + 1.31$ to $-0.000724 \times T_{\max}(°C) + 1.35$ can be within $-0.000724 \times T_{\max}(°C) + 1.31$ to less than $-0.000724 \times T_{\max}(°C) + 1.38$ and $-0.000724 \times T_{\max}(°C) + 1.38$ or higher.

Claim 10 recites the limitation "a seed crystal" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim because prior to the cited limitation, the claim already has recited "a seed crystal" in the second line; therefore, it is not defined if the citation refers to the

previous claim limitation, or it is a new “seed crystal” limitation for the claimed single crystal process.

Claim 10 recites the limitation "a raw material” in the third line and the fifteenth line of the claim. There is insufficient antecedent basis for this limitation in the claim because prior to the cited limitation, the claim already has recited “a raw material” in the second line; therefore, it is not defined if the citation refers to the previous claim limitation, or it is a new “raw material” limitation for the claimed single crystal process.

Claim 10 recites the limitation "a single crystal” in the fourth line and eleventh line of the claim. There is insufficient antecedent basis for this limitation in the claim because prior to the cited limitations, the claim already has recited “a single crystal” in the second line; therefore, it is not defined if the citation refers to the previous claim limitation, or it is a new “a single crystal” limitation for the claimed single crystal process.

Claim 10 recites the limitation "the range of a value of V/G" in the seventh line of the claim. There is insufficient antecedent basis for this limitation in the claim because prior to the recited limitation, however the claim recites “a determined range”, it is not defined if the citation refers to the previous claim limitations or it is a new limitation for the claimed process.

The recitation "determined range" in the claim 10 is a relative term which renders the claim indefinite. The term "determined" is not defined by the claim, the specification does not provide a standard for ascertaining the term of

"determined", and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The recitation "desired defect region" and “desired defect-free region” in the claim 10 is a relative term which renders the claim indefinite. The term "desired" is not defined by the claim, the specification does not provide a standard for ascertaining the term of “desired”, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim 27, recites the limitation "a single crystal” in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim because prior to the cited limitation, claim 10 already has recited “a single crystal” in the second line, fourth line, and eleventh line; therefore, it is not defined if the citation refers to the previous claim limitation, or it is a new “a single crystal” limitation for the claimed single crystal process.

Response to Arguments

Applicant's arguments filed on 07/17/2008 have been fully considered but they are not persuasive.

Applicants argue that “claims 26 and 27 are not product by the process claims. Instead, claims 26 and 27 are method claims that properly depend from in respect claim 10” (see lines 20-22, page 6); however, applicant’s argument was not persuasive because MPEP 2113 [R-1] clearly recites “product by the process claims are limited by and defined by the process, determination of

patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior art product was made by a different process. Therefore, in respect to claims 26 and 27, no patentable weight is given to the process which the single crystal is obtained; since Falster et al (US '597) anticipates the products which is claimed in claims 26-27, the rejection of claims 26-27 is proper and thus the rejection is maintained.

Applicants argue that "because the two methods as described by Iida and Kitamura involve completely different structures and materials, one of ordinary skill in the art would not have combined the teachings of the applied references"; (See lines 17-19, page 7) Furthermore, applicants argue that "because the CZ method is completely different from the method taught by Kitamura, the two methods do not belong to the same technical field, as the office action asserts." (See lines 16-17, page 8) Also, applicants argue that "however, the method of producing the single crystal in each technique and the technical problems associated therewith differ greatly and, therefore, one of ordinary skill in the art would not have combined the teachings of the applied references." (See page 8, lines 21-24)

This is not found persuasive because combining the prior arts Iida et al. ('395) in view of Kitamura et al. (US '944) to reject a method of producing a single crystal as claimed in claim 1 is proper because Iida et al. ('395) and

Kitamura et al. (US '944), both teach similar process steps for producing single crystals since both of these references include the step of immersing a seed crystal into a raw material melt and further growing a single crystal by rotating and pulling the seed crystal; furthermore, as recited above in the body of the rejection, Kitamura et al. (US '944) provide a strong motivation for combining the teachings of Iida et al. ('395) in view of Kitamura et al. (US '944). Therefore, it would have been obvious for one of ordinary skill in the art to combine Iida et al. ('395) in view of Kitamura et al. (US 2001/0001944) to reject claims 10, 14, 18, and 22.

Applicants argue that "$T_{max}(°C)$ is not the melting point of silicon to 1400°C, as the office action assumes. Moreover, substituting 1414°C and 1400°C as $T_{max}(°C)$ in the recited mathematical expressions would yield values between 0.286-0.366. This range is considerably higher than the range described by Iida. Accordingly, contrary to the office action's allegations, Iida fails to teach or suggest that the single crystal is pulled with controlling the value of the (V/G)". (See page 9, lines 13-19)

This is not found persuasive because applicants attention is drawn to the point that Iida et al. ('395) has not been used alone, but it is a combination rejection made over Iida et al. ('395) in view of Kitamura et al. (US '944). Furthermore, according to the claim, $T_{max}(°C)$ is the highest temperature of the raw material melt at an interface between a crucible inner wall and a raw

material melt. Iida et al. ('395) teaches the melted silicon raw material is provided within a crucible, and further, a single crystal is pulled with a temperature within 1560°C to 1400°C. (See abstract, lines 51-67, column 7, and lines 1-13, column 8) Therefore, Iida et al. ('395) clearly teach a highest temperature of the melt inside of the crucible. Also, Iida et al. ('395) teaches controlling the value of F/G such that the value of F/G falls within a range of 0.119 – 0.121 ($mm^2/°C \bullet \min$) at the center of the crystal. (See abstract)

Further, in response to the applicant's argument that "substituting 1414°C and 1400°C as $T_{\max}(°C)$ in the recited mathematical expressions would yield values between 0.286-0.366. This range is considerably higher than the range described by Iida et al", applicant's attention is drawn to the point that according to the claim, the recited mathematical expressions would yield values of $-0.000724 \times T_{\max}(°C) + 1.38$ or higher which substituting the temperatures as taught by Iida et al. ('395) into the recited mathematical expressions satisfies the requirements of the claim limitations in the instant application. Thus, rejection of claims 10, 14, 18, and 22 over Iida et al. ('395) in view of Kitamura et al. (US '944) is proper.

Therefore, rejections of claims 10, 14, 18, 22, and 26 – 27 are maintained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Masoud Malekzadeh whose telephone number is 571-272-6215. The examiner can normally be reached on Monday – Friday at 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin, can be reached on (571) 272-1189. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public

PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance form a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. M. M./

Examiner, Art Unit 1791

/Steven P. Griffin/

Supervisory Patent Examiner, Art Unit 1791